Fundamentals

Definition:

A first order ODE (i.e. Ordinary Differential Equation) has the following form

$$\frac{dy}{dx} = f(x, y)$$

where y is the dependent variable and x is the independent variable.

Separability:

An ODE is separable if and only if it can be written as

$$\begin{aligned} \frac{dy}{dx} &= g(x) \cdot h(y) \\ \implies \frac{dy}{h(y)dx} &= g(x) \end{aligned}$$

so that it can be solved simply by taking integral at the both sides

$$\int \frac{dy}{h(y)dx} dx = \int g(x) dx$$

Equilibrium Solution

An equilibrium solution (if any) is a constant function that safisties a given D.E. In order to find them, we can simply let all derivatives to be zero and solve for the unknown function.

Note: the result MUST be a constant function of the independent variable. (i.e. $y(x) = 1$ is acceptable, but $x = 1$ is NOT.)